After all the organisation has been perfected and the machinery lubricated and put in motion, it would be apt to run wild if some trustworthy and absolute method of control should not be at hand. This I have found completely accomplished by a department which has to do with the compilation of facts and the deductions from them. It is absolutely essential, in a company operating a number of plants, that those in control should not only know what each one of its manufactured products costs, but what enters into making up that cost, so that if for any reason there is a drain going on it will be quickly known, located and stopped; or if, on the other hand, something advantageous shall have been accomplished, that will also be noted and imitated at other points. This may seem like an exceedingly difficult undertaking in an industry of such infinite variety, but a brief consideration will show that it is not so. The statistical department, to which I allude, is not only able to advise the officers within a reasonable time after the end of each month of the cost of every product and step, but also of the profit or loss on each article and the total profit or loss of the company. These results have been so exact that for several years the profits determined by public accountants at the end of the year have not varied 1 per cent. from those which had been worked up in this statistical department month by month. The importance of this information to those in control will be readily understood. For my own part, I do not see how it would be possible intelligently to run a large enterprise involving a number of plants without some such arrangement.

The exact plan which I would recommend is as follows:—

Each factory furnishes monthly the following reports:—raw materials received; raw materials used; shipments of finished products; stocks of raw materials; stocks of finished products. Productions and statement of statistical charges (including manufacturing labour, labour on repairs, material taken from the storehouse for repairs, all material taken from the storehouse for manufacturing except fuel and raw materials), packages, dry barrels, &c., included in the selling price and not returnable, manufacturing cartage (*i.e.* teams used around the works), steam and water.

The first shows the number of pounds of raw material received, together with cost of placing in the pile, and by adding the amount of bills, freight, &c., we get the actual cost per hundred pounds of each. These figures are used in obtaining the material cost of each hundred pounds of production, which, with sundries, labour, fuel, and repairs, makes up the total manufacturing cost, and in connection with that shows what each department has accomplished during the month.

As each of the factory sheets is checked and every pound of raw material and finished product accounted for, nothing escapes which should be considered in costs.

In addition to the manufacturing cost are shown the cost per 100lb. of special factory charges (including such accounts as docks, dredging, fire equipment, laboratory, lighting, roads, maintenance of yards, watchmen, gatemen, &c.), and cost per 100lb. of goods produced due to salaries of superintendents and chemists, based on proportion of labour of each department and the total manufacturing labour.

The factory shipment sheets are checked with the accounting department as well as repairs and net selling prices obtained, lighterage, cartage, allowances, estimated freights, &c., being deducted.

By using the manufacturing costs and the net selling prices, we arrive each month at the gross manufacturing profits, and deducting taxes, insurance, office, and other general expenses, the net results are obtained.

All organisation, whether in the chemical industry or any other, would fail to attain the best and most permanent results if the personal equation be forgotten. We are not dealing with a collection of apparatus, but with an organisation of men, everyone an individual, with his own peculiarities and ambitions. The day has not come, if it ever will, when from purely altruistic motives a man will give his most efficient services. He must realise that while his best work must be done, it will not go unnoticed and unrewarded. He must be sure that he will receive just and proportionately liberal treatment. His proper ambitions must not be smothered, they must be directed. From an experience of many years, I believe the plan outlined above provides fully for this most important fact, and I can point with the greatest pleasure to many men as proof of my statement, and every one more enthusiastic than at the beginning. The places of the leaders will someday be vacant. Who, then, shall fill them? Those whose lives have been spent in preparation for the work, and who will enter into it without shock or derangement of existing conditions, but as naturally as the stream flows into the river. Thus will the natural ambition of the young man reach its fulfilment in due time, and thus will our beloved industry progress to points of attainment which some of us may dream of, but will never see.

A vote of thanks to the president for his address was then proposed by Prof. Divers and seconded by Sir Henry Roscoe, the first president of the society, in the course of which allusion was made both to the valuable character of the address to which the members had just listened, to the origin of the society some twenty-five years ago, and to the considerable growth in its membership which the council's report indicated. In responding, Dr. Nichols spoke of the advantage which ensued to the society as a whole as a consequence of the visit last year to America, followed, as it happily had been, by the present visit to England of a considerable number of members from the other side of the Atlantic. He said how much he and his fellow-countrymen appreciated the hospitality that had been already shown them, and the efforts that had been made in connection with the interesting and lengthy programme that had been arranged largely for their benefit. He said that in New York they had been anxious to provide some souvenir of their visit that they might leave behind them, and, on informing the meeting of the report of the scrutineers, which declared that Prof. Divers, F.R.S., had been elected president for the ensuing year, he desired to place in his hands the little thing that they had ventured to have prepared. This was a presidential badge formed of a medallion of Sir Humphry Davy surrounded by an emblematical device representing the union of England and America in the pursuit of chemical science. He trusted that the council of the society would authorise the wearing of the badge by all his successors in the office of president, and hoped it would help still further to cement the good feeling and cordiality which existed between members of this great society on both sides of the Atlantic. He concluded by announcing the names of the vice-presidents and ordinary members of the council who had been found to be duly elected to office.

Prof. Divers expressed, on behalf of the society, appreciation of the kindness which had dictated the offer of this valuable presidential badge.

On the motion of Dr. Bailey, seconded by Mr. Hübner, who on behalf of Manchester promised a very hearty reception, it was resolved that the next annual general meeting should be held in that city.

On the motion of Prof. Chandler, of Colombia University, seconded by Sir Boverton Redwood, the hearty thanks of the society were accorded to the senate and council of University College for granting permission to the society to meet in that building. This was responded to by Sir William Ramsay, who incidentally referred to the fact that University College as a separate corporation had just ceased to exist, having become absorbed in and an essential part of the University of London. The meeting then adjourned.

THE UNIVERSITY OF SHEFFIELD.

AS has already been noted in these columns, the new buildings of the University of Sheffield were on Wednesday of last week opened by the King and Queen, and by the act a new centre for research was created in this country.

Nothing seems to have been lacking to make the ceremony a success; all taking part, from the King downwards, entered into the proceedings with enthusiasm. In replying to the address of welcome presented by the city, the King said that he and the Queen were glad to be present to open the university buildings and to inaugurate a work which he was assured would tend to promote the advancement of knowledge and the spread of culture among all classes in the city. He had no doubt that the establishment of the university would also afford facilities for the technical training which is now essential to success in every industrial enterprise, and concluded by saying that he should follow the progress of the university with warm interest. It may be mentioned here, as indicating His Majesty's interest in the spread of university teaching, that he has since sent through Lord Londonderry a letter to the Lord Mayor of Sheffield stating that "the opening of the new university buildings was felt by their Majesties to be an occasion of great importance. His Majesty has recognised with pleasure the desire felt in some of the great centres of industry and commerce that universities should take a prominent part in the promotion of scientific knowledge and research. . . . His Majesty recognises that in these days of constantly increased application of science and of scientific method to every department of modern life, it is to the universities that the nation must largely look for maintaining that position in relation to great commercial and industrial problems which is essential to the social well-being of his Empire."

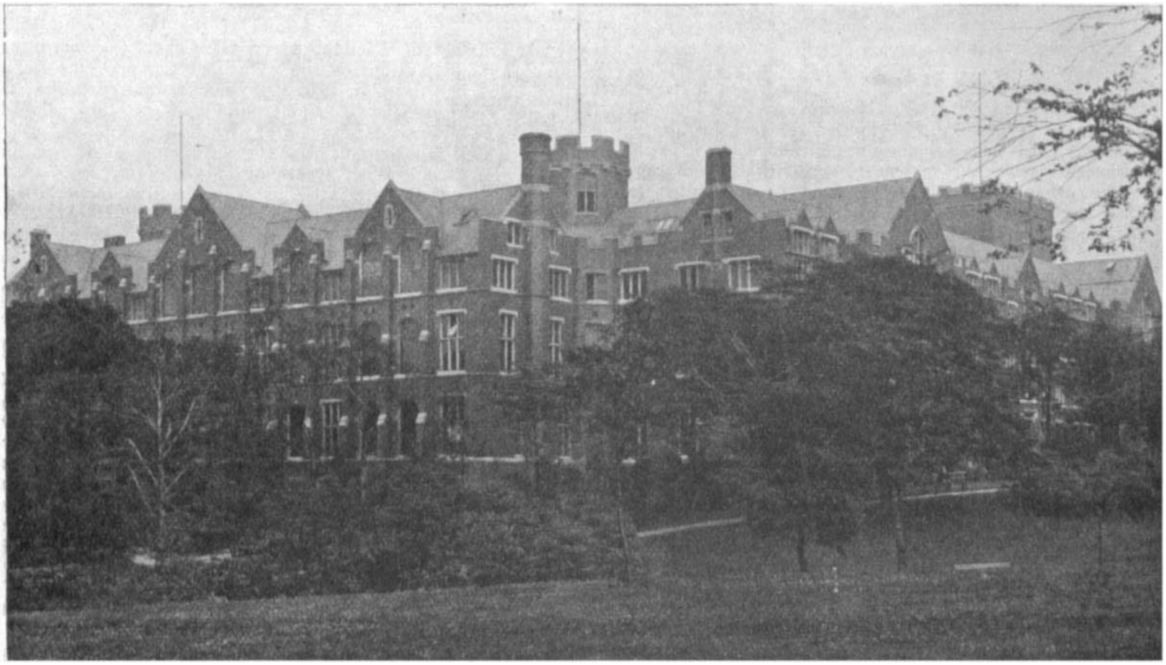

Photo. by Pawson and Brailsford, Sheffield.

FIG. 1.—The University Buildings from Weston Park.

His Majesty has also sent the following reply to the address presented to him by the university authorities:—"I view with lively satisfaction the establishment of this and other universities in large industrial centres, and it gives me great pleasure to open the handsome and spacious buildings provided for the University of Sheffield. I have never ceased to watch with great interest the great development of the wide movement for the encouragement of a sound and liberal education among all classes of my people, and I am well assured that the expectations of those patriotic and enlightened men by whose efforts were established the institutions from which the University of Sheffield derives its origin will be justified by the achievements of those who are educated within these walls."

The opening ceremony was preceded by the reading of the above-mentioned address from the University by the Chancellor—the Duke of Norfolk—from which we extract the following sentences:—"We bear in proud and grateful memory the fact that on more than one previous occasion members of your Royal House have shown an interest in the instructions from which the University of Sheffield derives its origin, and we gladly recall what has been already achieved in the course of your reign to advance that wider movement of which this university is but a sign and symbol. The early years of your Majesties' reign must always be remarkable as having witnessed that more general awakening on the part of your Majesties' subjects to the advantages of higher education in all branches of learning and that better understanding of its needs and requirements which is evidenced by the almost simultaneous creation of five independent universities, at Birmingham, Manchester, Liverpool, Leeds, and Sheffield. The distinction conferred upon the inauguration of our university by the gracious presence of your Majesties here to-day is of the happiest omen for its future, and we can only hope and pray that the teaching given within these buildings, the learning acquired within these walls, and the influences that will follow from them, may prove not unworthy of the great honour you have done us, and may be a constant source of profit and of ever-increasing usefulness to all classes of your Majesties' loyal and loving subjects within these districts."

The Duke of Norfolk then addressed the King, and in the course of his remarks, after paying tribute to the men to whom the university movement in Sheffield is mainly due, stated that it was now three years since it had been thought necessary to gather into one home the various sources of educational work which the university ought to supply; and the faculties of arts, of pure science, and of medicine have now been gathered together. Applied science is in another very adjacent building. He stated that every class in Sheffield has shown keen interest in the work, and that the sum of 20,000*l.* is needed to meet the expense of erecting and endowing the university.

Reference having been made to the granting in May last of the charter to the university, the King was handed a key and requested to declare the university open. This he did, speaking as follows:—"I have great pleasure in declaring these beautiful buildings open; and it is my fervent hope and desire for the long-continued prosperity of the University of Sheffield."

The following is a short description of the new buildings. The illustration (which we are able to give by permission of Messrs. Pawson and Brailsford, of Sheffield) is a view of the university from Weston Park.

The buildings are constructed of red brick and stone in the Tudor style of architecture, form three sides of a quadrangle, and are situated upon a site overlooking Weston Park. A tower has been erected at one corner of the quadrangle, octagonal turrets at two of the other corners, the site of the third turret together with the fourth side of the quadrangle being left vacant in order to provide for future extensions. The building on the south side, which faces Western Bank, contains the large hall of the University; this hall is to be known by the name of the Firth Hall, after the founder of Firth College. The Firth Hall is designed to accommodate an audience of about 800 persons. In the same building are the administrative offices, the council room, the common rooms and refectories. The building on the west side provides for the departments in the faculties of arts and pure science, that on the north for the departments in the medical faculty. The faculty of applied science is located on a separate site about four minutes away in St. George's Square.

The physical laboratories contain a superficial area of 10,000 square feet, and are self-contained on three floors connected by a spiral staircase and apparatus lift, the rooms on each floor being arranged on either side of a central corridor except those on the lower ground floor, which, owing to the slope of the ground, are confined to the quadrangle front. Accommodation is provided for all the various departments of physics, except electrical engineering, which is housed in the buildings for applied science in St. George's Square.

The chemical department occupies the northern half of the top floor in the western block, and has a floor area, including corridors, of 7400 square feet. Two lecture theatres are provided. The larger, 30 feet by 40 feet, is furnished with seating accommodation for 110 students. A preparation room for lecture experiments adjoins this. On the other side of the corridor is a smaller lecture theatre to accommodate 34 students; this will be utilised for tutorial work, and for work with small classes.

There are laboratories for elementary and advanced students, and a small one for research work.

The biological department, which includes the two subjects of zoology and botany, adjoins the chemical department, and occupies the southern half of the top floor of the west wing. A lecture room is also allotted to this department on the first floor, and the whole of the upper part of the tower. There are two lecture rooms, the larger having accommodation for about 80 students. The general laboratory, with a raised platform and table for the purpose of practical demonstrations, and the botanical laboratory afford accommodation for 30 students each; there is also a zoological laboratory for advanced students, besides zoological and botanical research laboratories.

The anatomical department includes a large lecture theatre, a museum, several research laboratories, and private rooms for the professor and demonstrators. Accommodation for microscopes and stereoscopes is provided, also a set of the most modern anthropological instruments, and requisites for students who may desire to do work in modern developments of anatomy.

The physiological department has an area of about 5400 square feet. There are nine rooms in the department, and no corridors, the rooms opening into each other; the three largest of these are the general laboratory, 70 feet by 25 feet, the chemico-physiological laboratory, 50 feet by 25 feet, and the lecture theatre. Another large room in the department is the general research room, 25 feet by 30 feet. The rooms in this department, like all the other rooms on the north front, are lighted with specially large windows in order to facilitate microscopical work, and have several concealed sinks in the floor, which, when opened, reveal supplies of gas, water, and electricity, thus avoiding the necessity of fixed benches, their place being taken by movable tables.

The pathological department occupies the whole of the upper floor of the medical block; the main feature is the large students' laboratory facing north, 70 feet by 26 feet, divided by two partitions. There are adjoining this two laboratories, one large and one small, intended for the bacteriological work to be done in connection with the City Health Department. A special feature consists of an incubating room in the centre of the department, so arranged that it can be kept at a constant temperature; this room will replace the ordinary incubating ovens. There is a large lecture theatre in the department, a museum with a top and a south light, a special research laboratory, also private rooms, photographic and store rooms—the last two mentioned being in the roof and the turrets above the department.

The new buildings allotted to the engineering department consist of four floors; the lowest floor or basement contains a large extension of the original laboratories. The main engineering laboratory contains a plant which can be used both by mechanical and electrical engineering students. There is also a very complete electrical equipment in the new building to demonstrate the applications of electricity to lighting, traction, and power transmission.

The department of metallurgy has had special attention paid to it, seated as it is in a city where the chief national metallurgical industry is carried on. As a natural consequence of this, so far as iron and steel metallurgy is concerned, the metallurgical laboratories of the University of Sheffield are unique. These laboratories are divided into two sections, the scientific and the practical. In the first named there are nine, and in the second two laboratories.

GEOLOGICAL NOTES.

AMONG recent publications of the Geologische Reichsanstalt of Vienna, Herr G. Geyer (*Verhandlungen*, 1904, p. 363) discusses the nature of the pre-Jurassic floor of Austria, from a study of blocks of crystalline rock embedded in Liassic sandstone, and of the island-like "Klippe," formed of granite, which lies N.W. of Weyer, and which has been utilised for the memorial of von Buch. This mass of granite, by-the-by (Toula, *ibid.*, 1905, p. 89), was correctly appreciated as a projecting mass of older land, and not as an erratic block, by von Hochstetter as far back as 1869. Herr Geyer refers to many instances of "exotic blocks" north of the Alps, and points out the influence of the old gneissic and granitic foundation on the subsequent folding in the region of the Enns. Herr R. J. Schubert (*ibid.*, 1904, p. 461) adds greatly to our knowledge of the Upper Eocene and Oligocene beds of Dalmatia, while Dr. Franz Kossmat (*ibid.*, 1905, p. 71) shows how the Sava began to flow eastward on the uplifted floor of a Miocene gulf, and formed the plain near Laibach by filling in a depression that developed during the latest movements of the Alps. In the department of palæontology, Dr. Katzer (*ibid.*, 1905, p. 45) furnishes an interesting account of the microscopic structure of the Devonian Tentaculite-limestones of Bohemia, which may be regarded as a valuable supplement to Novák's work on Tentaculites (*Beiträge zur Pal. Oesterreich-Ungarns,* ii. Bd., 1882). Herr Theodor Fuchs (*Jahrbuch der k.k. Reichsanstalt,* 1904, p. 359) reviews in considerable detail a number of recent papers on fucoids, and concludes that these problematic organisms were not washed into the strata after the manner of floating seaweeds, but arose where they are now found. He insists that museum-specimens in such cases are likely to be misleading, and that a study of fucoids in the field shows that some, at any rate, run perpendicularly to the strata by which they are surrounded. Herr G. Stache (*Verhandlungen,* 1905, p. 100) again investigates the globular Cretaceous organism named by him Bradya, and gives it new interest by showing its resemblance, in structure and mode of occurrence, to Brady's recent genus Keramosphæra, described in 1882 from the deep sea south of Australia. Bradya has long been connected with Steinmann's hydrozoan form Porosphæra; but Stache is now able to revive it, and once more to refer it to the foraminifera. Students of our well known British form Parkeria will find much to interest them in this paper. Herren Hofmann and Zdarsky (*Jahrbuch,* 1904, p. 577) discuss and illustrate the dentition of Deinotherium, and the abundant remains of a species of antelope, from the Miocene beds of Leoben.

The *Transactions of the Geological Society of South Africa* for January to April contain several stratigraphical and structural papers by Dr. Molengraaff and others; but general interest will be raised by the illustrated description of the great Cullinan diamond, by Messrs. Hatch and Corstorphine, on p. 26. In the *Transactions of the South African Philosophical Society,* vol. xvi. (1905), Mr. Rogers